



# Defense Science and Technology Seminar On Emerging Technologies

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## *Image and Simulation Webs*

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# Smart Sensor Web *Objectives*



***SSW Vision:*** An intelligent, web-centric distribution and fusion of sensor information . . . that provides greatly enhanced situational awareness, on demand, to Warfighters at lower echelons.

“... emphasizes **large arrays of local sensors** joined with other assets: imagery, weather, weapons, simulations, etc. . . .”



**Jump-start the acquisition process for SSW by leveraging *Service & DARPA* efforts**  
**Develop, through experimentation, a conceptual system design for SSW**

- Enhanced situational awareness
- On-demand intelligent information
  - Images, weather, weapons, etc.
- Available to lower echelons
- Rapid weapon response

“Tactical and engagement level situation awareness, and extended range tactical engagement (including beyond line-of-sight), have the highest payoff of any protection option.”  
(FY99 - Army Science Board)

***SSW Complements and Assists Army SA Programs***



# Smart Sensor Web *Integrated Products*



- IR, Visual imagery



*Image Web*

- Enemy vehicle location information



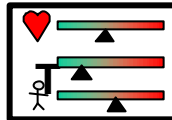
*Weapons Web*

- 3-D Simulated view for mission planning



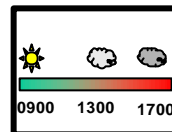
*Simulation Web*

- Soldier health status



*Physio-Web*

- Forecast, Nowcast, Wind direction & speed



*Weather Web*

- Blue & Red force locations; maps; building plans



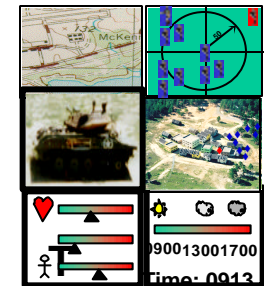
*MOUT Infra-Structure*

*Information Integration Web*

RF Comms



User



*Integrated Display*

*Army Lead*



# Smart Sensor Web Image Web



Demonstrate efficient methods to put  
“eyes on target”

**Testbed Approach** : Utilize low-power, non-imaging sensors to detect activity and trigger imagers.

Saves **POWER** and **BANDWIDTH**

## FY00 Highlights :

- Established flexible testbed to assess utility of distributed sensors
- Obtained valuable feedback from soldiers
- IW Web Page (<http://206.246.112.22>)

## Path Forward :

- Wireless, infrared fire-team imager
- Additional phenomenologies (radar, chem-bio)
- Data compression techniques
- UAV

## Testbed Hardware (August 2000)



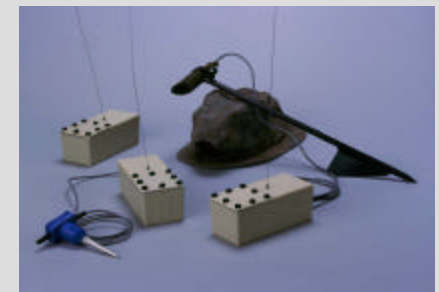
Uncooled, micro-bolometer, infrared imager [NVESD]



Omni-directional imaging and tracking [DARPA]



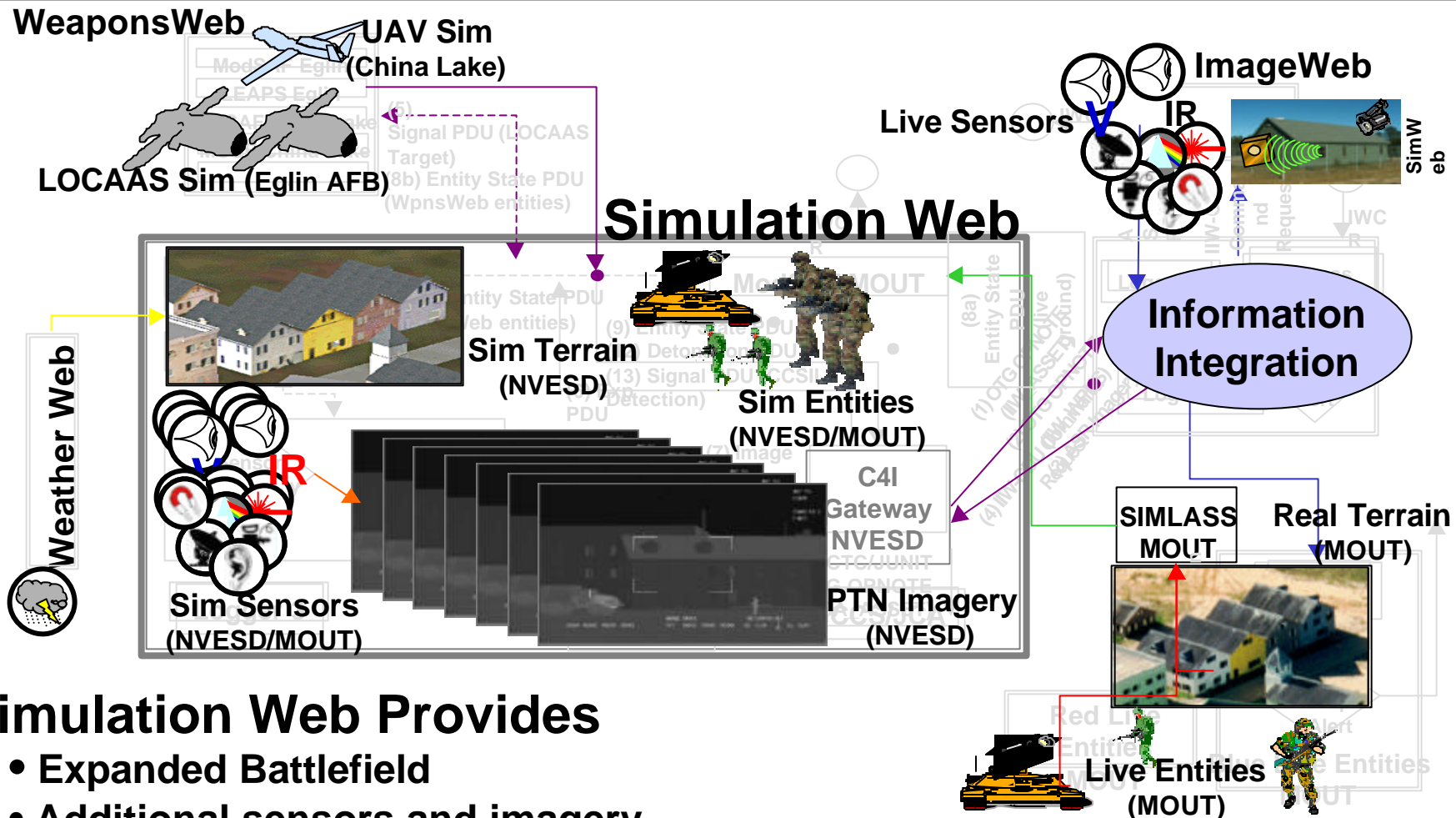
UGV with acoustic array, cued vis/IR imager [ARL]





# Simulation Web

## *Distributed Live/Virtual Testbed*



## Simulation Web Provides

- Expanded Battlefield
- Additional sensors and imagery
- Interface between Weapons and Live Entities to Information Integration
- Simulation Experiments to supplement live experiments
- Common terrain for all simulators



# Smart Sensor Web

## *Benefits to the Army's Vision*

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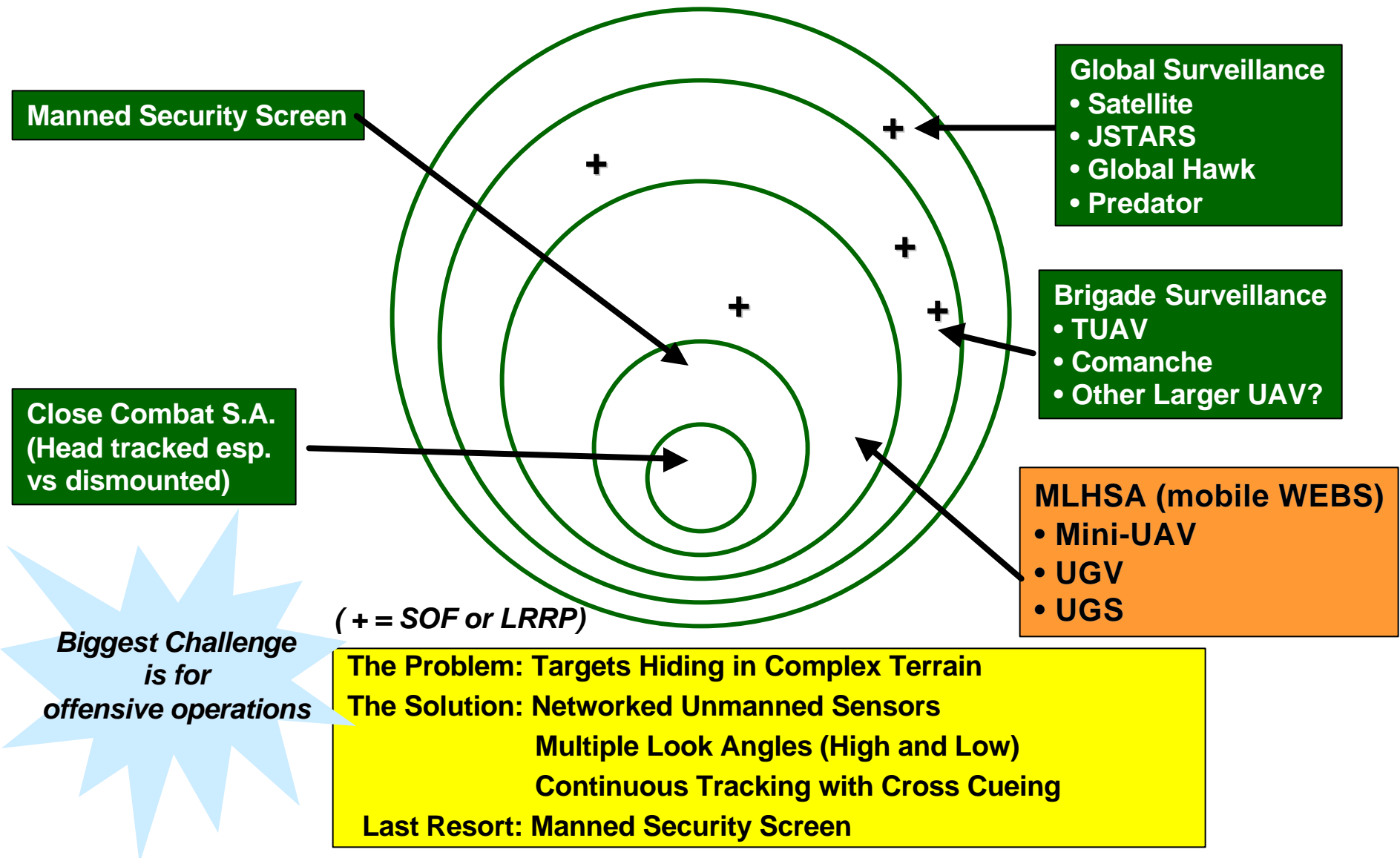
- Established the infrastructure for the conduct of user evaluations (McKenna MOUT site)
  - Conducted APLA Experiments using SSW Data collection and Uncooled IR (30 Oct –3 Nov)
- Acquired the 1<sup>st</sup> generation Low Cost Uncooled IR Cameras and allowed initial field evaluation
- SSW allow validated of the overarching sensor architecture for the Army's SA and APLA requirements – “early warning followed by confirming imagery”
- Development of sensor simulation and communication effects for Robust man in the loop simulation
- Establishment of high fidelity MOUT Terrain data base to conduct Man in the Loop simulation runs
- Obtained initial user feedback on the utility of distributed sensors for beyond line of sight (BLOS) Situational Awareness





# Layered Surveillance for the Objective Force/FCS

Goal: Complete Situation Awareness and Timely BLOS Targeting  
(Avoid Unintentional Close Combat)



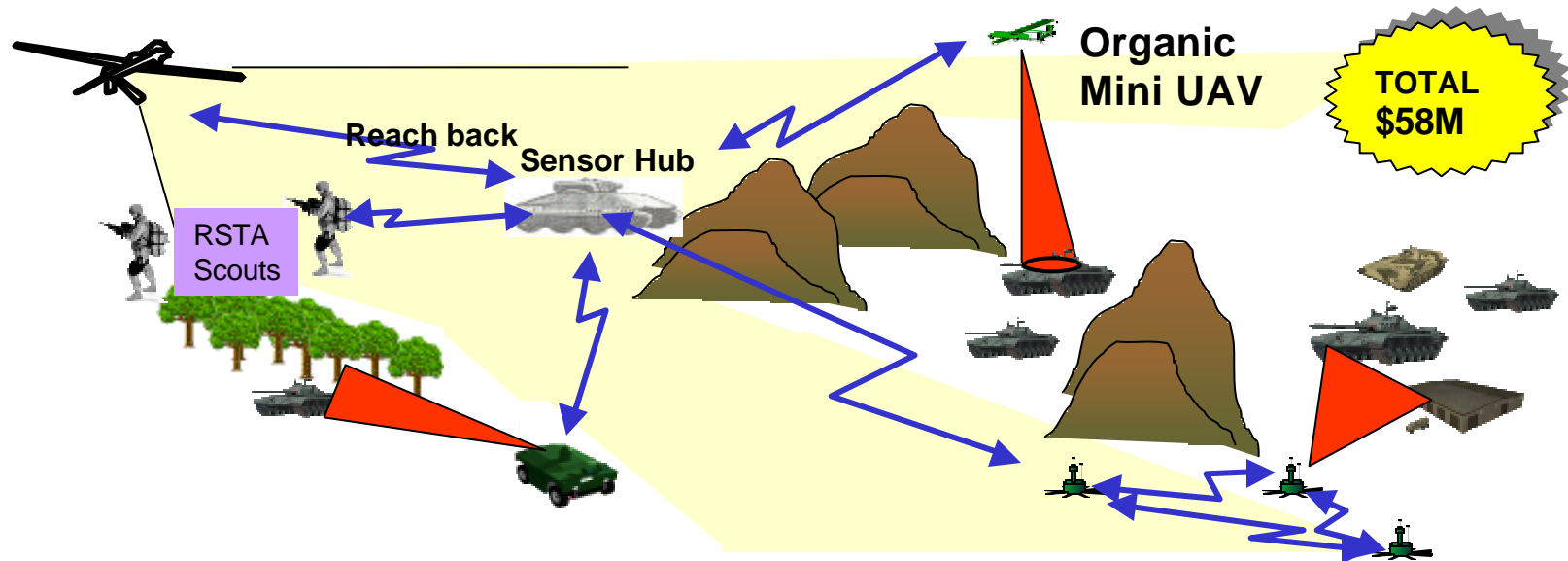


# Sensors for the Objective Force (SfOF)

STO III.IS.2001.02 (FY02-05)



**Objective: Develop a new generation of low cost sensor systems for manned and unmanned scouts, robotic vehicles and UAVs that move with the force**



## Enabling Technologies:

- Low cost unattended sensor payloads for mini-UAVs, UGVs and UGS
  - uncooled IR
  - Eyesafe laser gated SWIR imaging
- Use “reach back” links, and develop data fusion & smart sensor management tools to optimize the deployment of mobile sensors

## Warfighter Payoffs:

- Demonstrate mobile sensors systems for BLOS SA for enhancing survivability and lethality
- More organic coverage area per scout
- Supports Objective Force concept development

***Distributed Sensors Fill the SA Gaps – Complements Global Surveillance***





# Sensors for the Objective Force

## *Virtual Simulation Strategy*



Where do they fit on the Battlefield?

Will they make a Difference?

Where does the Information go?

Red Team

Blue Team

● Denotes Blue sensor deployment ● Denotes Red Team position

Red Team uses terrain features and stealthy tactics to avoid detection while approaching Blue Team position. Blue Team uses terrain analysis tools to determine deployment location of distributed sensors to detect and target incoming Red Team. Iterative runs of this type of scenario will be executed to establish statistical basis for distributed sensor effectiveness.

***“Hide and Seek” Exercises to Evaluate Effectiveness***



# Smart Sensor Web

## *Conclusions and Recommendations*

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### CONCLUSIONS:

- An Organic Distributed Sensor Network offers the means for the Army's Objective Force and Marine Expeditionary Commanders to argument their Situational Understanding (SU) by filling the gaps in the higher echelon surveillance
- OSD SSW products and lessons learn feed directly into the Army ATD proposal for "Sensors for the Objective Force" and will reduce transition risk for the ATD.

### RECOMMENDATIONS:

- OSD SSW and Army Sensors for the Objective Force efforts coordinate to maximize SSW resources and transition opportunities
- Use OSD SSW to develop the integration of distributed sensor data into the Common Operational Picture (COP) in a joint Army/USMC environment.
- Reinstate scalability and mobility experiments